

इंटरनेट

मानक

### Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 14643 (1999): Unsintered Polytetrafluoroethylene (PTFE)  
Tape for Thread Sealing Applications [PCD 12: Plastics]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



भारतीय मानक

चूड़ी सीलबन्दी अनुप्रयोगों के लिए सिन्ट रहित पोलि-  
टेट्राफ्लोरोइथाइलीन (पी टी एफ ई) का फीता — विशिष्ट

*Indian Standard*

UNSINTERED POLYTETRAFLUOROETHYLENE  
(PTFE) TAPE FOR THREAD SEALING  
APPLICATIONS — SPECIFICATION

ICS 83.140.50

© BIS 1999

**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

February 1999

Price Group 3

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

The purpose of this standard is to establish the acceptance standards for unsintered polytetrafluoroethylene (PTFE) tape for general engineering applications for use at temperatures up to 200°C. Material complying with this standard may not be desirable for use in certain critical applications, for example, where contact with high concentrations of gaseous oxygen or liquid oxygen is involved. In case the tape is to be used for these applications the matter is subject to the agreement between the purchaser and the supplier.

In the preparation of this standard, considerable assistance has been derived from BS 4375 : 1968 'Unsintered PTFE tape for thread sealing applications' and BS 6974 : 1991 'Unsintered PTFE tape for thread sealing applications (coarse threads)' issued by the British Standards Institution.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## Indian Standard

# UNSINTERED POLYTETRAFLUOROETHYLENE (PTFE) TAPE FOR THREAD SEALING APPLICATIONS — SPECIFICATION

### 1 SCOPE

**1.1** This standard prescribes the requirements, method of sampling and tests for unsintered polytetrafluoroethylene (PTFE) tapes for use as a thread sealing material and in similar applications.

**1.2** This tape is suitable for applications under ambient conditions with all common fluids and gases up to 80 bar\* gauge for pipes. This tape is suitable for applications in the range  $-20^{\circ}\text{C}$  to  $200^{\circ}\text{C}$  for pipe sizes up to 50 mm.

#### NOTES

**1** Purchaser shall consult the manufacturer regarding the use of the tape with threads.

**2** Purchaser shall consult the manufacturer regarding the suitability of the tape for use with a particular liquid or gas and for use at pressures above 80 bar.

**3** Manufacturers' instructions may limit the size and pressure of applications at extremes of temperatures.

**4** For high temperatures and for high pressure combinations the purchaser shall be aware of the need to use fittings of the appropriate quality.

**5** The preferred minimum width and the preferred thickness of the tapes are usually 12 mm and 0.075 mm respectively.

### 2 NORMATIVE REFERENCES

The following Indian Standards contain provisions which through reference in the text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
554 : 1985	Dimensions for pipe threads where pressure tight joints are required on the threads ( <i>third revision</i> )
1239 (Part 1) : 1990	Mild steel tubes, tubulars and other wrought steel fittings: Part 1 Mild steel tubes ( <i>fifth revision</i> )
1381 (Part 2) : 1977	Boiling flasks: Part 2 Flasks with conical ground socket ( <i>first revision</i> )

\*1 bar =  $10^5 \text{ N/m}^2 = 100 \text{ kPa}$ .

#### IS No.

#### Title

5165 : 1969	Interchangeable conical ground-glass joints
10640 : 1983	Soxhlet extractors
12305 : 1983	Laboratory sintered (fritted) filters, porosity grading, classification and designation
IS/ISO 9000	Quality management and quality assurance standards
(Part 1) : 1994	Guidelines for selection and use ( <i>first revision</i> )
(Part 2) : 1993	General guidelines for the application of ISO 9001, ISO 9002 and ISO 9003
14635 : 1998	Polytetrafluoroethylene (PTFE) materials for moulding and extrusion

### 3 REQUIREMENTS

#### 3.1 Composition

##### 3.1.1 Manufacture

The tape shall be manufactured from a suitable grade of virgin PTFE material (*see* IS 14635). The tape shall not contain fillers or additives other than residual lubricant.

When determined by the method described in Annex A, the residual lubricant content shall not exceed 0.1 percent by mass.

**3.1.2** The lubricant used in the manufacture of the tape shall be such that any residue left in the tape shall be entirely removed under the conditions of test for the determination of residual lubricant content.

NOTE — For applications involving high concentration of gaseous oxygen or liquid oxygen, the lubricant type and content in PTFE thread sealing tape is critical. In these cases it is essential that the user shall refer to the oxygen supplier to determine if any fire or explosive risk exists.

#### 3.2 Appearance and Finish

**3.2.1** The unsintered PTFE tape, when viewed by reflected light, shall appear white.

**3.2.2** It shall be free from any inclusions visible to the naked eye and shall be free from any surface or edge defects which may affect its suitability for use.

### 3.3 Tolerance and Dimensions

#### 3.3.1 Length

When determined by the method described in Annex B, the actual length of the tape on a spool shall not be less than that marked on the spool.

#### 3.3.2 Width

When determined by the method described in Annex B, the mean width of the tape on a spool shall not differ from that marked on the spool by more than  $\pm 0.5$  mm.

#### 3.3.3 Thickness

When determined by the method described in Annex B, the thickness of the tape at any measured point shall not differ from the mean of the readings by more than  $\pm 10$  percent.

### 3.4 Thread Wrapping Properties

Any sample of the tape shall conform to and hold the thread form, shall not break and the finishing end of the tape shall remain in position with no tendency to unwind when tested as described in Annex C.

### 3.5 Sealing

Any sample of the tape shall form a leak free seal when tested by the method described in Annex D.

## 4 SAMPLING

**4.1** Any samples of tape used for the tests specified in 3 shall be taken from tape prepared for spooling or taken from a wound spool omitting the external layer or wrapping.

**4.2** The method and frequency of sampling shall be as agreed between the purchaser and the supplier.

## 5 PACKING AND MARKING

### 5.1 Packing

The reels, rolls or spool of unit length of tape shall be packed suitably as agreed to between the purchaser and the supplier.

### 5.2 Marking

Each spool, roll or reel of unit length of tape and/or the packages shall be indelibly and legibly marked with the following information:

- i) Indication of the source of manufacture, registered trade-mark, if any;
- ii) Date of manufacture;
- iii) Batch No. or Code No., if any;
- iv) Nominal length, width and thickness of the tape;
- v) Instructions for use and wrapping technique; and
- vi) Intended use if this is a critical application for example with gaseous or liquid oxygen.

NOTE — The tape manufacturer shall provide sufficient information on the applications and use of the tape together with any special measures or techniques which may be needed when the tape is being used under extremes of pressure, temperature or size.

### 5.3 BIS Certification Marking

Each package containing the roll, reel or spool of length of tape may also be marked with the Standard Mark.

**5.3.1** The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## ANNEX A

(Clause 3.1.1)

## DETERMINATION OF RESIDUAL LUBRICANT CONTENT

## A-1 PRINCIPLE

The residual lubricant is determined by the loss in mass of a sample after extraction with petroleum spirit and subsequent heating at 300°C.

## A-2 REAGENT

**A-2.1 Petroleum Spirit** (boiling range 40 to 60°C), of general purpose laboratory reagent quality.

**WARNING — PETROLEUM SPIRIT IS HIGHLY FLAMMABLE. TAKE PRECAUTIONS TO AVOID IGNITION. ALSO AVOID BREATHING THE VAPOUR AND CONTACT OF THE PETROLEUM SPIRIT WITH SKIN OR EYES.**

## A-3 APPARATUS

**A-3.1 Soxhlet extractor** (*see* IS 10640) with a nominal capacity of 100 ml, the socket joint shall be of 34/35 size, as specified in IS 5165, the cone joint shall be of 24/29 size, as specified in IS 5165, and the extraction thimble fitted with a glass plate (*see* IS 12305) with a maximum pore diameter within the range 100 µm to 160 µm.

NOTE — Suitable sizes of extraction thimble are given in Table 1 of IS 10640.

## A-3.2 Condenser

**A-3.3 Boiling Flask**, with conical ground glass joint [*see* IS 1381 (Part 2)], size 29/32.

**A-3.4 Air Circulation Oven**, capable of being maintained at a temperature of  $100 \pm 5^\circ\text{C}$  and  $300 \pm 5^\circ\text{C}$ .

## A-3.5 Metal Crucible

**A-3.6 Balance**, of sufficient capacity to weigh the metal crucible to an accuracy of 0.1 mg.

## A-3.7 Desiccator

## A-4 PROCEDURE

## A-4.1 Extraction

Clean, dry and weigh the extraction thimble fitted with the fitted glass plate (**A-3.1**) to the nearest 0.1 mg using the balance (**A-3.6**).

Cut approximately 15 g of the tape sample as specified in 4. Place the tape into the extraction thimble fitted with the fitted glass plate and weigh to the nearest 0.1 mg.

Insert the extraction thimble fitted with the fitted glass plate and tape into the Soxhlet extractor (**A-3.1**). Pour 300 to 400 ml of petroleum spirit (**A-2.1**) into the boiling flask (**A-3.3**). Assemble the boiling flask, Soxhlet extractor and condenser (**A-3.2**) and subject the tape to at least 60 extractions during a continuous period of not less than 4 h.

After the extraction is completed, remove the thimble from the apparatus and dry in an air circulation oven (**A-3.4**) maintained at  $100 \pm 5^\circ\text{C}$ .

## A-4.2 Heating

Clean, dry and weigh the metal crucible (**A-3.5**) using the balance (**A-3.6**). Transfer the extracted tape from the thimble to the metal crucible and place them in the air circulation oven at  $300 \pm 5^\circ\text{C}$  for 6 h. At the end of this period remove the metal crucible from the oven and cool in the desiccator (**A-3.7**). Remove the metal crucible from the desiccator and using the balance, weigh the crucible and tape.

## A-5 EXPRESSION OF RESULTS

The residual lubricant content shall be taken as the difference between the original mass of the tape and the mass of the tape after the extraction and heating treatments. Calculate and report the result to the nearest 0.1 percent.

## ANNEX B

(Clauses 3.3.1, 3.3.2 and 3.3.3)

## MEASUREMENT OF TAPE DIMENSIONS

## B-1 APPARATUS

**B-1.1 Device**, for measuring lengths of 1 m to an accuracy of  $\pm 0.5$  mm and lengths of 10 to 25 mm to an accuracy of  $\pm 0.1$  mm.

**B-1.2 A Micrometer Gauge**, capable of reading to an accuracy of 0.002 5 mm and having a foot not less

than 6.3 mm in diameter. The micrometer shall apply a pressure at the foot of between 10 kPa and 20 kPa when used for measuring the tape.

## B-2 PROCEDURE

**B-2.1** Lay the tape out free from tension in close contact along its length with a flat surface. Measure



the length of tape on the spool using the apparatus (B-1.1).

**B-2.2** Determine the width of the tape sample using the apparatus (B-1.1) to an accuracy of  $\pm 0.1$  mm at points approximately 50 mm from each end and at a minimum of three other points equi-spaced between the first two readings. Take the mean value of the readings as the width of the tape.

**B-2.3** Take readings of the thickness of the tape sample using the micrometer gauge (B-1.2) at points

approximately 50 mm from each end and at a minimum of three other points equi-spaced between the first two readings. Take the mean value of the readings as the thickness of the tape.

### B-3 EXPRESSION OF RESULTS

Report the length of tape on the spool, the width of the tape sample and the thicknesses of the tape sample and the mean of the thicknesses.

## ANNEX C

(Clause 3.4)

### THREAD WRAPPING TEST

#### C-1 APPARATUS

**C-1.1 Brass Pipe**, approximately 250 mm in length and with a wall thickness not thinner than 2 mm, cut at one end to give an R 1/2 external taper pipe thread (see IS 554).

#### C-2 PROCEDURE

Wind a length of the tape sample round the thread by

hand with a 50 percent overlap to give a double layer covering (see Fig. 1), using minimal sufficient tension for the tape to take up the form of the thread.

#### C-3 EXPRESSION OF RESULT

Report the extent to which the wound tape and the end of the tape are in contact with the thread.

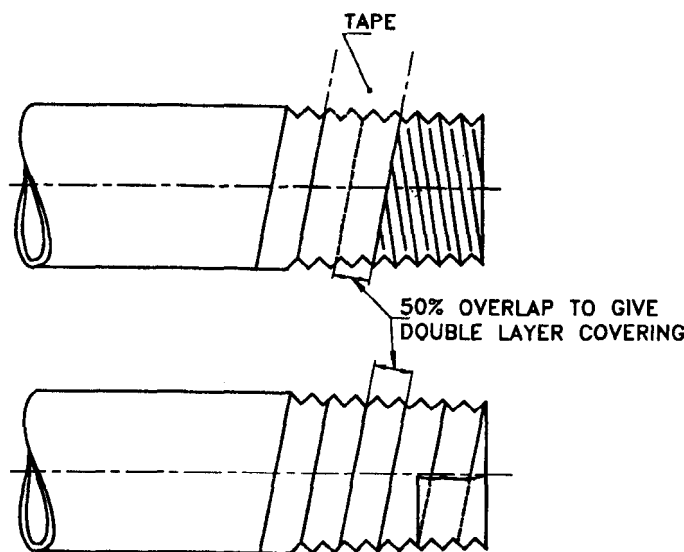


FIG. 1 THREAD WRAPPING TEST

## ANNEX D

(Clause 3.5)

### THREAD SEALING TESTS

#### D-1 STEEL COUPLING COMPONENTS

##### D-1.1 Steel Tubes

Prepare the appropriate number of pieces of tube of

nominal length 250 mm in the sizes specified in Table 1, machined in heavy tube [see IS 1239 (Part 1)]. The pieces of tube shall be threaded with the external thread, specified in Table 1 (see IS 554).

NOTE — It is acceptable for the purposes of tests to use proprietary fittings manufactured under the control of recognized quality assurance procedures such as are detailed in IS/ISO 9000 (Parts 1 and 2) for the samples specified in D-1.1 and D-1.2.

**Table 1 Steel Tube Samples**

Sl No.	Sample Reference	Nominal Bore of Tube (mm)	External Thread
(1)	(2)	(3)	(4)
i)	TP1	3	R 1/8
ii)	TP2	15	R 1/2
iii)	TP3	25	R 1
iv)	TP4	50	R 2
v)	TP12 <sup>1</sup>	50	R 2

<sup>1</sup>TP12 is subject to test at 80 bar and shall be manufactured for this duty.

### D-1.2 Steel Sockets

Prepare the appropriate number of steel sockets [IS 1239 (Part 1)] in the sizes specified in Table 2. The sockets shall be threaded with an internal thread, specified in Table 2 (see IS 554).

**Table 2 Steel Socket Samples**

Sl No.	Sample Reference	Nominal Bore	Internal Thread
(1)	(2)	(3)	(4)
i)	TP 5	6	Rp 1/8
ii)	TP 6	15	Rp 1/2
iii)	TP 7	25	Rp 1
iv)	TP 8	50	Rp 2
v)	TP 9	15	Rc 1/2
vi)	TP 10	25	Rc 1
vii)	TP 11	50	Rc 2
viii)	TP 13 <sup>1</sup>	50	Rp 2

<sup>1</sup>TP 13 is subject to test at 80 bar and shall be manufactured for this duty.

### D-2 ASSEMBLY OF COUPLING

Assemble combinations of steel tubes wrapped with the PTFE tape under test and sockets, prepared in accordance with D-1, as specified in Table 3. Apply the PTFE tape under test to the tube threads as described in D-2.

**Table 3 Quantity, Assembly and Designation of Test Couplings**

Sl No.	Number of Couplings	Tube Samples to be Screwed into Socket	Socket Sample	Designation of Test Coupling
(1)	(2)	(3)	(4)	(5)
i)	5	TP 1	TP 5	TP 1/TP 5
ii)	5	TP 2	TP 6	TP 2/TP 6
iii)	2	TP 2	TP 9	TP 2/TP 9
iv)	5	TP 3	TP 7	TP 3/TP 7
v)	5	TP 3	TP 10	TP 3/TP 10
vi)	4	TP 4	TP 8	TP 4/TP 8
vii)	4	TP 4	TP 11	TP 4/TP 11
viii)	3	TP 12	TP 13	TP 12/TP 13

Assemble the test couplings listed in Table 3 excluding TP 4/TP 8, TP 4/TP 11 and TP 12/TP 13 couplings by screwing the socket onto the pipe until hand-tight. Using a suitable gripping tool providing a leverage of 300 mm tighten a further one and a half turns.

Assemble test couplings TP 4/TP 8, TP 4/TP 11 and TP 12/TP 13 by screwing the socket onto the pipe until hand-tight. Using a suitable gripping tool apply a torque of 170 N-m until the joint locks.

### D-3 SEALING TESTS

#### D-3.1 General

All tests shall be carried out in an ambient temperatures of  $27 \pm 5^\circ\text{C}$ . Gas leakage shall be determined by the appearance of bubbles noted after the first 15 s of immersion.

#### D-3.2 Pressure Test at 10 Bar Pressures

Test one of each of the following test couplings (see D-1):

TP 1/TP 5  
TP 2/TP 6  
TP 2/TP 9  
TP 3/TP 7  
TP 3/TP 10  
TP 4/TP 8  
TP 4/TP 11

Connect each of the couplings to an air or nitrogen pressure supply of 10.0-10.5 bar. Immerse the couplings in water which is at a temperature of  $27 \pm 5^\circ\text{C}$  for a minimum of 5 minutes. Remove the couplings from the water and store vertically under pressure for 168 h at  $27 \pm 5^\circ\text{C}$ . Reimmerse the couplings in water at  $27 \pm 5^\circ\text{C}$  for 5 minutes and inspect for any gas leakage.

#### D-3.3 Pressure Test at 80 Bar Pressure

Connect one TP 12/TP 13 test coupling to an air or nitrogen pressure supply of 80.0 - 80.5 bar. Immerse the coupling in water at a temperature of  $27 \pm 5^\circ\text{C}$  for 5 minutes and inspect for any gas leakage.

#### D-3.4 Heat Cycling Test at 10 Bar Pressure

Test one of each of the following test couplings:

TP 1/TP 5  
TP 2/TP 6  
TP 3/TP 7  
TP 3/TP 10  
TP 4/TP 8  
TP 4/TP 11

Heat each coupling to  $200 \pm 5^\circ\text{C}$  and maintain at this temperature for 1 h. Allow each coupling to cool to  $27 \pm 5^\circ\text{C}$  over a period of 30 minutes. Repeat this heating/cooling cycle five more times. Connect each coupling to an air or nitrogen pressure supply of

10.0-10.5 bar. Immerse the couplings in water at a temperature of  $27 \pm 5^{\circ}\text{C}$  and inspect for any gas leakage.

#### D-3.5 Heat Cycling Test at 80 Bar

Take one TP12/TP13 coupling which has been subjected to the test described in D-3.3 and carry out the following heat cycling test. Heat the coupling to  $100 \pm 5^{\circ}\text{C}$  and maintain at this temperature for 1 h. Allow the coupling to cool to  $27 \pm 5^{\circ}\text{C}$ . Repeat this heating/cooling cycle five more times. Connect the assembly to an air or nitrogen pressure supply of 80.0 to 80.5 bar. Immerse the assembly in water at a temperature of  $27 \pm 5^{\circ}\text{C}$  for 5 minutes and inspect for any gas leakage.

#### D-3.6 Hot Water Test

Test one of each of the following test couplings:

TP 1/TP 5  
TP 2/TP 6  
TP 2/TP 9  
TP 3/TP 7  
TP 3/TP 10  
TP 4/TP 8  
TP 4/TP 11  
TP12/TP 13

Connect each coupling to an air or nitrogen pressure supply of 10.0-10.5 bar. Immerse the couplings in water at a temperature of  $65 \pm 2^{\circ}\text{C}$  for 6 h and inspect for any gas leakage.

Repressurize the TP12/TP13 test coupling to 80.0-80.5 bar. Immerse the assembly in water at a temperature of  $65 \pm 2^{\circ}\text{C}$  for 6 h and inspect for any gas leakage.

#### D-3.7 Resistance to Low Temperature

D-3.7.1 Test at 10 bar pressure. Test one of each of the following test couplings:

TP 1/TP 5  
TP 2/TP 6  
TP 3/TP 7  
TP 3/TP 10

Immerse each coupling in *n*-pentane at a temperature of  $-20 \pm 2^{\circ}\text{C}$  and apply a pressure of 10.0-10.5 bar using air or nitrogen for 1 h. Inspect for any leakage.

D-3.7.2 Test at 80 bar. Immerse a TP12/TP13 test coupling in *n*-pentane at a temperature of  $-20 \pm 2^{\circ}\text{C}$  and apply a pressure of 80.0 - 80.5 bar for 1 h using air or nitrogen. Inspect for any gas leakage.

#### D-3.8 Resistance to Hydrocarbons

Test one of each of the following test couplings:

TP 1/TP 5  
TP 2/TP 6  
TP 3/TP 7  
TP 3/TP 10  
TP 4/TP 8  
TP 4/TP 11

Fill each coupling with a mixture of 70 percent of 2,2,4-trimethylpentane and 30 percent of toluene (v/v) and allow to stand vertically for 168 h at a temperature of  $27 \pm 5^{\circ}\text{C}$ . Drain and then connect each coupling to an air or nitrogen pressure supply of 10.0-10.5 bar. Immerse in water at  $27 \pm 5^{\circ}\text{C}$  for 5 minutes and inspect for any gas leakage.

## Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publication), BIS.

### Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc: No. PCD 12 (1397).

#### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

#### BUREAU OF INDIAN STANDARDS

##### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones: 323 01 31, 323 33 75, 323 94 02

Telegrams: Manaksanstha  
(Common to all offices)

##### Regional Offices:

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

Telephone

323 76 17, 323 38 41

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola  
CALCUTTA 700054

{ 337 84 99, 337 85 61  
337 86 26, 337 91 20

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022

{ 60 38 43  
60 20 25

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113

{ 235 02 16, 235 04 42  
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)  
MUMBAI 400093

{ 832 92 95, 832 78 58  
832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.  
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI.  
HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR.  
PATNA. PUNE. THIRUVANANTHAPURAM.